Kuestion

Engineering Maths

www.kreatryx.com

Contents

Manual for Kuestion

Why Kuestion?

It's very overwhelming for a student to even think about finishing 100-200 questions per chapter when the clock is ticking at the last moment. This is the reason why Kuestion serves the purpose of being the bare minimum set of questions to be solved from each chapter during revision.

What is Kuestion?

A set of 40 questions or less for each chapter covering almost every type which has been previously asked in GATE. Along with the Solved examples to refer from, a student can try similar unsolved questions to improve his/her problem solving skills.

When do I start using Kuestion?

It is recommended to use Kuestion as soon as you feel confident in any particular chapter. Although it will really help a student if he/she will start making use of Kuestion in the last 2 months before GATE Exam (November end onwards).

How do I use Kuestion?

Kuestion should be used as a tool to improve your speed and accuracy chapter wise. It should be treated as a supplement to our K-Notes and should be attempted once you are comfortable with the understanding and basic problem solving ability of the chapter. You should refer K-Notes Theory before solving any "Type" problems from Kuestion.

Type 1: Linear Algebra

For Concepts, please refer to Engineering Mathematics K-Notes, Linear Algebra

Unsolved Problems:

Q.1 If for a matrix, rank equals both the number of rows and number of columns, then the matrix is called

(A) Non-singular (B) singular (C) transpose (D) minor

Q.2 The equation $\begin{vmatrix} 2 & 1 & 1 \\ 1 & 1 & -1 \\ y & x^2 & x \end{vmatrix} = 0$ represents a parabola passing through the points.

(A) (0, 1), (0, 2), (0, -1)

(B) (0, 0), (-1, 1), (1, 2)

(C) (1, 1), (0, 0), (2, 2)

(D) (1, 2), (2, 1), (0, 0)

Q.3 If matrix $X = \begin{bmatrix} a & 1 \\ -a^2 + a - 1 & 1 - a \end{bmatrix}$ and $X^2 - X + I = 0$ then the inverse of X is

(A) $\begin{bmatrix} 1-a & -1 \\ a^2 & a \end{bmatrix}$

(B) $\begin{bmatrix} 1-a & -1 \\ a^2 - a + 1 & a \end{bmatrix}$

(C) $\begin{bmatrix} -a & 1 \\ -a^2 + a - 1 & a - 1 \end{bmatrix}$

(D) $\begin{bmatrix} a^2 - a + 1 & a \\ 1 & 1 - a \end{bmatrix}$

Q.4 Consider the matrices $X_{4\times3}$, $Y_{4\times3}$ and $P_{2\times3}$. The order of $\left[P\left(X^TY\right)^{-1}P^T\right]^T$ will be

(A) 2x2 (B) 3x3 (C) 4x3 (D) 3x4

Q.5 The rank of the matrix $\begin{bmatrix} 1 & 1 & 1 \\ 1 & -1 & 0 \\ 1 & 1 & 1 \end{bmatrix}$ is

(A) 0 (B) 1 (C) 2 (D) 3

Q.6 The matrix $M = \begin{bmatrix} -2 & 2 & -3 \\ 2 & 1 & 6 \\ -1 & -2 & 0 \end{bmatrix}$ has given values -3, -3, 5. An eigen vector corresponding to the eigen value 5 is $[1 \quad 2 \quad -1]^T$. One of the eigen vector of the matrix M^3 is

(A) $[1 \quad 8 \quad -1]^T$

(B) $[1 \quad 2 \quad -1]^T$

(C) $\left[1 \quad \sqrt[3]{2} \quad -1\right]^T$

(D) $[1 \quad 1 \quad -1]^T$

Q.7 The system of equations x + y + z = 6, x + 4y + 6z = 20, x + 4y + $\lambda z = \mu$ has no solutions for values of λ and μ given by

(A) $\lambda = 6, \mu = 20$
(B) $\lambda = 6, \mu \neq 20$
(C) $\lambda \neq 6, \mu = 20$
(D) $\lambda \neq 6, \mu \neq 20$

Q.8 Let P be 2x2 real orthogonal matrix and $\bar{x}$ is a real vector $\begin{bmatrix} x_1 & x_2 \end{bmatrix}^T$ with length $\|\bar{x}\| = \left(x_1^2 + x_2^2\right)^{1/2}$. Then which one of the following statement is correct?

(A) $\|p\bar{x}\| \leq \|\bar{x}\|$ where at least one vector satisfies $\|p\bar{x}\| < \|\bar{x}\|$
(B) $\|p\bar{x}\| = \|\bar{x}\|$ for all vectors $\bar{x}$
(C) $\|p\bar{x}\| \leq \|\bar{x}\|$ where at least one vector satisfies $\|p\bar{x}\| < \|\bar{x}\|$
(D) No relationship can be established between $\|\bar{x}\|$ and $\|p\bar{x}\|$

Q.9 The characteristics equation of a 3 x 3 matrix P is defined as $\alpha(\lambda) = [\lambda I - P] = \lambda^3 + 2\lambda + \lambda^2 + 1 = 0$. If I denotes identity matrix then the inverse of P will be

(A) $P^2 + P + 2I$
(B) $P^2 + P + I$
(C) $-\left(P^2 + P + I\right)$
(D) $-\left(P^2 + P + 2I\right)$

Q.10 A set of linear equations is represented by the matrix equations Ax = b. The necessary condition for the existence of a solution for the system is

(A) A must be invertible
(B) b must be linearly dependent on the columns of A
(C) b must be linearly independent on the columns of A
(D) None.

Q.11 Consider a non-homogeneous system of linear equations represents mathematically an over determined system. Such a system will be

(A) Consistent having a unique solution.
(B) Consistent having many solution.
(C) Inconsistent having a unique solution.
(D) Inconsistent having no solution.

Q.12 The trace and determinant of a 2x2 matrix are shown to be -2 and -35 respectively. Its eigen values are

(A) -30, -5 (B) -37, -1 (C) -7, 5 (D) 17.5, -2

Type 2: Differential Equations

For Concepts, please refer to Engineering Mathematics K-Notes, Differential Equations.

Unsolved Problems:

Q.1 For the differential equation $f(x,y)\frac{dy}{dx}+g(x,y)=0$ to be exact is

(A) $\frac{\partial f}{\partial y}=\frac{\partial g}{\partial x}$

(B) $\frac{\partial f}{\partial x}=\frac{\partial g}{\partial y}$

(C) f = g

(D) $\frac{\partial^2 f}{\partial x^2}=\frac{\partial^2 g}{\partial y^2}$

Q.2 The differential equation $\frac{dy}{dx}+py=Q$, is a linear equation of first order only if,

(A) P is a constant but Q is a function of y
(B) P and Q are functions of y (or) constants
(C) P is function of y but Q is a constant
(D) P and Q are function of x (or) constants

Q.3 Biotransformation on of an organic compound having concentration (x) can be modelled using an ordinary differential equation $\frac{dx}{dt}+kx^2=0$, where k is reaction rate constant. If x = a at t = 0 then solution of the equation is

(A) $x=a\,e^{-kx}$

(B) $\frac{1}{x}=1/a+k\,t$

(C) $x=a\left(1-e^{-kt}\right)$

(D) x = a + k t

Q.4 Transformation to linear form by substituting $v=y^{1-n}$ of the equation $\frac{dy}{dt}+p(t)\,y=q(t)y^n$, n > 0 will be

(A) $\frac{dv}{dt}+(1-n)pv=(1-n)q$

(B) $\frac{dv}{dt}+(1+n)pv=(1+n)q$

(C) $\frac{dv}{dt}+(1+n)pv=(1-n)q$

(D) $\frac{dv}{dt}+(1+n)pv=(1+n)q$

Q.5 For $\frac{d^2y}{dx^2}+4\frac{dy}{dx}+3y=3e^{2x}$, the particular integral is

(A) $\frac{1}{15}e^{2x}$

(B) $\frac{1}{5}e^{2x}$

(C) $3e^{2x}$

(D) $C_1e^{-x}+C_2e^{-3x}$

Q.6 Solution of the differential equation $3y\frac{dy}{dx}+2x=0$ represents a family of

(A) ellipses (B) circles (C) parabolas (D) hyperbolas

Q.7 Which one of the following differential equation has a solution given by the function $y=5\sin\left(3x+\frac{\pi}{3}\right)$

(A) $\frac{dy}{dx}-\frac{5}{3}\cos(3x)=0$ (B) $\frac{dy}{dx}+\frac{5}{3}(\cos 3x)=0$

(C) $\frac{d^2y}{d^2x}+9y=0$ (D) $\frac{d^2y}{dx^2}-9y=0$

Q.8 The order and degree of a differential equation $\frac{d^3y}{dx^3}+4\sqrt{\left(\frac{dy}{dx}\right)^3+y^2}=0$ are respectively

(A) 3 and 2 (B) 2 and 3 (C) 3 and 3 (D) 3 and 1

Q.9 The maximum value of the solution y (t) of the differential equation $y(t)+\ddot{y}(t)=0$ with initial conditions $\dot{y}(0)=1$ and y(0) = 1, for t ≥ 0 is

(A) 1 (B) 2 (C) π (D) $\sqrt{2}$

Q.10 It is given that $y''+2y'+y=0$, y(0) = 0 & y(1) = 0. What is y(0.5) ?

(A) 0 (B) 0.37 (C) 0.82 (D) 1.13

Q.11 A body originally at 60° cools down to 40 in 15 minutes when kept in air at a temperature of 25°c. What will be the temperature of the body at the and of 30 minutes?

(A) 35.2° C (B) 31.5°C (C) 28.7°C (D) 15°C

Q.12 The solution $\frac{d^2y}{dx^2}+2\frac{dy}{dx}+17y=0\ ;\ y(0)=1,\left(\frac{dy}{dx}\right)_{x=\pi/4}=0$ in the range $0<x<\pi/4$ is given by

(A) $e^{-x}\left[\cos 4x+\frac{1}{4}\sin 4x\right]$ (B) $e^{x}\left[\cos 4x-\frac{1}{4}\sin 4x\right]$

(C) $e^{-4x}\left[\cos 4x-\frac{1}{4}\sin\ x\right]$ (D) $e^{-4x}\left[\cos 4x-\frac{1}{4}\sin 4x\right]$

Type 3: Probability and Statistics

For Concepts, please refer to Engineering Mathematics K-Notes, Probability and Statistics.

Unsolved Problems:

Q.1 The probability that it will rain today is 0.5. the probability that it will rain tomorrow is 0.6. The probability that it will rain either today or tomorrow is 0.7. What is the probability that it will rain today and tomorrow?

(A) 0.3 (B) 0.25 (C) 0.35 (D) 0.4

Q.2 Let P(E) denote the probability of an event E. Given P(A) = 1. P(B) = $\frac{1}{2}$ the values of P(A/B) and P(B/A) respectively are

(A) $\frac{1}{4},\frac{1}{2}$ (B) $\frac{1}{2},\frac{1}{4}$ (C) $\frac{1}{2},1$ (D) $1,\frac{1}{2}$

Q.3 If P and Q are two random events, then which of the following is true?

(A) Independence of P and Q implies that probability $P(P\cap Q)=0$

(B) Probability $(P\cap Q)\geq$ Probability (P) + probability (Q)

(C) If P and Q are mutually exclusive then they must be independent

(D) Probability $(P\cap Q)\leq$ Probability (P)

Q.4 The random variable X takes on the values 1, 2 (or) 3 with probabilities $\frac{2+5P}{5},\frac{1+3P}{5}$ and $\frac{1.5+2P}{5}$ respectively the values of P and E(X) are respectively

(A) 0.05, 1.87 (B) 1.90, 5.87 (C) 0.05, 1.10 (D) 0.25, 1.40

Q.5 An examination consists of two papers, paper 1 and paper 2. The probability of failing in paper 1 is 0.3 and that in paper 2 is 0.2. Given that a student has failed in paper 2, the probability of failing in paper 1 is 0.6. The probability of a student failing in both the papers is

(A) 0.5 (B) 0.18 (C) 0.12 (D) 0.06

Q.6 $P_X(X)=Me^{(-2|x|)}+Ne^{(-3|x|)}$ is the probability density function for the real random variable X, over the entire x – axis, M and N are both positive real numbers. The equation relating M and N is

(A) $M+\frac{2}{3}N=1$ (B) $2M+\frac{1}{3}N=1$

(C) M +N = 1 (D) M+N = 3

Q.7 There value of x and y are to be fitted in a straight line in the form y= a + bx by the method of least squares. Given $\sum x = 6$, $\sum y = 21$, $\sum x^2 = 14$, $\sum xy = 46$, the values of a and b are respectively

(A) 2, 3 (B) 1, 2 (C) 2, 1 (D) 3, 2

Q.8 A fair coin is tossed 10 times. What is the probability that only the first two tosses will yield heads?

(A) $\left(\frac{1}{2}\right)^2$ (B) $10c_2\left(\frac{1}{2}\right)^2$

(C) $\left(\frac{1}{2}\right)^{10}$ (D) $10c_2\left(\frac{1}{2}\right)^{10}$

Q.9 A discrete random variable X takes value from 1 to 5 with probabilities as shown in the table. A student calculates the mean of X as 3.5 and her teacher calculates the variance to X as 1.5. Which of the following statements is true?

K	1	2	3	4	5
$P(X=K)$	0.1	0.2	0.4	0.2	0.1

(A) Both the student and the teacher are right

(B) Both the student and the teacher are wrong

(C) The student is wrong but the teacher is right

(D) The student is right but the teacher is wrong

Q.10 It is estimated that the average number of events during a year is three. What is the probability of occurrence of not more than two events over a two-year duration? Assume that the number of events follow a poisson distribution.

(A) 0.052 (B) 0.062 (C) 0.072 (D) 0.082

Q.11 The annual precipitation data of a city is normally distributed with mean and standard deviation as 1000 mm and 200 mm. respectively. The probability that the annual precipitation will be more than 1200 mm is

(A) < 50 % (B) 50% (C) 75% (D) 100%

Q.12 An unbiased coin is tossed five times. The outcome of each loss is either a head or a tail. Probability of getting at least one head is _____

(A) $\frac{1}{32}$ (B) $\frac{13}{32}$ (C) $\frac{16}{32}$ (D) $\frac{31}{32}$

Type 4: Numerical Methods

For Concepts, please refer to Engineering Mathematics K-Notes, Numerical Methods.

Unsolved Problems:

Q.1 The formula used to compute an approximation for the second derivative of function f at a point x_0 is

(A) $\frac{f(x_0+h)+f(x_0-h)}{2}$

(B) $\frac{f(x_0+h)-f(x_0-h)}{2h}$

(C) $\frac{f(x_0+h)+2f(x_0)+f(x_0-h)}{h^2}$

(D) $\frac{f(x_0+h)-2f(x_0)+f(x_0-h)}{h^2}$

Q.2 The Newton-Raphson method is used to find the root of the equation $x^2-2=0$. If the iterations are started from -1, then the iteration will

(A) converge to –1

(B) converge to $\sqrt{2}$

(C) converge to $-\sqrt{2}$

(D) not converge.

Q.3 In the interval $[0, \pi]$ the equations x = cos x has

(A) No solution

(B) Exactly one solution

(C) Exactly 2 solutions

(D) An infinite number of solutions

Q.4 The polynomial $p(x)=x^5+x+2$ has

(A) all real roots.

(B) 3 real and 2 complex roots.

(C) 1 real and 4 complex roots.

(D) all complex roots.

Q.5 Match the following and choose the correct combination

Group – I

E. Newton-Raphson method

F. Runge-Kutta method

G. Simpson's Rule

H. Gauss elimination

Group – II

1) Solving non-linear equations.
2) Solving linear simulations equations.
3) Solving ordinary differential equations.
4) Numerical integration method.
5) Interpolation.
6) Calculation of eigen values.

(A)E – 6, F – 1, G – 5, H – 3.
(B)E – 1, F – 6, G – 4, H – 3.
(C)E – 1, F – 3, G – 4, H – 2.
(D)E – 5, F – 3, G – 4, H – 1.

Q.6 The real root of the equation $xe^x = 2$ is evaluated using Newton-Raphson's method. If the first approximation of the value of x is 0.8679, the 2nd approximation of the value of x correct to three decimal places is

(A) 0.865 (B) 0.853 (C) 0.849 (D) 0.838

Q.7 The estimate of $\int_{0.5}^{1.5} \frac{dx}{x}$ obtained using Simpson's rule with three-point function evaluation exceeds the exact value by

(A) 0.235 (B) 0.068 (C) 0.024 (D) 0.012

Q.8 During the numerical solution of a first order differential equation using the Euler (also known as Euler Cauchy) method with step size h, the local truncation error is of the order of

(A) h^2 (B) h^3 (C) h^4 (D) h^5

Q.9 For solving algebraic and transcendental equation which one of the following used?

(A) Coulomb's theorem
(B) Newton – Raphson method
(C) Euler's method
(D) Stoke's method

Q.10 The Newton-Raphson iteration can be used to compute

(A) Square of R
(B) reciprocal of R
(C) Square root of R
(D) Logarithm of R

Q.11 Equation $e^x - 1 = 0$ is required to be solved using Newton's method with an initial guess $x_0 = -1$. Then after one step of Newton's method estimate x_1 of the solution will be given by

(A) 0.71828 (B) 0.36784 (C) 0.20587 (D) 0.0000

Q.12 A numerical solution of the equation $f(x) = x + \sqrt{x} - 3 = 0$ can be obtained using Newton-Raphson method. If the starting value is x=2 for the iteration then the value of x that is to be used in the next step

(A) 0.306 (B) 0.739 (C) 1.8124 (D) 2.306

Type 5: Complex Functions

For Concepts, please refer to Engineering Mathematics K-Notes, Complex Functions.

Unsolved Problems:

Q.1 Consider the circle $|z - 5 - 5i| = 2$ in the complex number plane (x, y) with z = x + iy. The minimum distance from the origin to the circle is

(A) $5\sqrt{2} - 2$ (B) $\sqrt{54}$ (C) $\sqrt{34}$ (D) $5\sqrt{2}$

Q.2 For the function of a complex variable $W = \ln z$ (Where W = u + jv and z = x + jy) the u = constant lines get mapped in the z – plane as

(A) set of redial straight lines

(B) set of concentric circles

(C) set of confocal hyperbolas 2

(D) set of confocal ellipses.

Q.3 Potential function ϕ is given as $\phi = x^2 + y^2$. What will be the stream function ψ with the condition $\psi = 0$ at x = 0, y = 0?

(A) 2xy (B) $x^2 + y^2$ (C) $x^2 + y^2$ (D) $2x^2 + y^2$

Q.4 If ϕ (x, y) and ψ (x, y) are function with continuous 2nd derivatives then $\phi(x,y) + i\,\psi(x,y)$ can be expressed as an analytic function of x + iy $\left(i = \sqrt{-1}\right)$ when

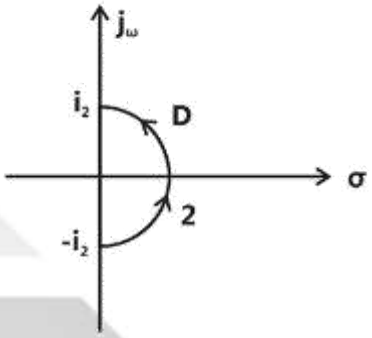
(A) $\frac{\partial\phi}{\partial x} = -\frac{\partial\Psi}{\partial x}, \frac{\partial\phi}{\partial y} = \frac{\partial\Psi}{\partial y}$

(B) $\frac{\partial\phi}{\partial y} = -\frac{\partial\Psi}{\partial x}, \frac{\partial\phi}{\partial x} = \frac{\partial\Psi}{\partial y}$

(C) $\frac{\partial^2\phi}{\partial x^2} + \frac{\partial^2\phi}{\partial y^2} = \frac{\partial^2\psi}{\partial x^2} + \frac{\partial^2\Psi}{\partial y^2} = 1$

(D) $\frac{\partial\phi}{\partial x} + \frac{\partial\phi}{\partial y} = \frac{\partial\psi}{\partial x} + \frac{\partial\Psi}{\partial y} = 0$

Q.5 If the semi-circular contour D of radius 2 is as shown in the figure. Then the value of the integral $\oint_D \frac{1}{s^2-1}\,ds$ is



(A) $i\pi$

(B) $-i\ \pi$

(C) $-\pi$

(D) π

Q.6 Given $X(z)=\frac{z}{(z-a)^2}$ with $|z| > a$, the residue of $X(z)z^{n-1}$ at z = a for $n \geq 0$ will be

(A) a^{n-1} (B) a^n (C) $n\ a^n$ (D) $n\ a^{n-1}$

Q.7 An analytic function of a complex variable z = x + i y is expressed as f(z) = u(x, y)+I v (x, y) where i = $\sqrt{-1}$, If u = xy then the expression for v should be

(A) $\frac{(x+y)^2}{2}+k$ (B) $\frac{x-y^2}{2}+k$

(C) $\frac{y^2-x^2}{2}+k$ (D) $\frac{(x-y)^2}{2}+k$

Q.8 The value of $\oint_C \frac{z^2}{z^4-1}\,dz$, using Cauchy's integral around the circle |z + 1| = 1 where $z=x+i\,y$ is

(A) $2\pi\ i$ (B) $-\pi i/2$ (C) $-3\pi i/2$ (D) $\pi^2 i$

Q.9 Consider likely applicability of cauchy's Integral theorem to evaluate the following integral counter clock wise around the unit circle C $I=\oint_C \sec z\ dx$, z being a complex variable. The value of I will be

(A) I = 0 ; Singularities set = ϕ

(B) I = 0 ; Singularities set = $\left\{\pm\frac{(2n+1)}{2}\pi / n=0,1,2,---\right\}$

(C) $I=\pi/2$; Singularities set = $\{\pm n\ \pi\ ;\ n=0,1,2,---\}$

(D) None of the above.

Q.10 Given $f(z)=\frac{1}{z+1}-\frac{2}{z+3}$. If C is a counter-clockwise path in the z-plane such that $|z+1|=1$, the value of $\frac{1}{2\pi j}\oint_C f(z)dz$ is

(A) –2 (B) –1 (C) 1 (D) 2

Q.11 For an analytic function f(x + I y) =u (x, y) + i v (x, y), u is given by $u=3x^2-3y^2$. The expression for v, considering K is to be constant is

(A) $3y^2-3x^2+k$

(B) 6x – 6y + k

(C) 6y – 6x = k

(D) 6xy + k

Q.12 The contour C in the adjoining figure is described by $x^2+y^2=16$. Then the value of $\oint_C \frac{z^2+8}{(0.5)z-(1.5)j}dz$

(A) $-2\pi j$ (B) $2\pi j$ (C) $4\pi j$ (D) $-4\pi j$

Type 6: Laplace Transform

For Concepts, please refer to Signals and Systems K-Notes, Laplace Transform.

Unsolved Problems:

Q.1 The Laplace transform of f(t) is F(s). Given $F(s)=\frac{\omega}{s^2+\omega^2}$, the final value of f(t) is ____.

(A) two (B) zero (C) one (D) none

Q.2 The inverse Laplace transform of the function $\frac{s+5}{(s+1)(s+3)}$ is _____

(A) $2e^{-t}-e^{-3t}$ (B) $2e^{-t}+e^{-3t}$
(C) $e^{-t}-2e^{-3t}$ (D) $e^{-t}+2e^{-3t}$

Q.3 The Laplace transform of $(t^2-2t)u(t-1)$ is _____.

(A) $\frac{2}{s^3}e^{-s}-\frac{2}{s^2}e^{-s}$ (B) $\frac{2}{s^3}e^{-2s}-\frac{2}{s^2}e^{-s}$
(C) $\frac{2}{s^3}e^{-s}-\frac{2}{s}e^{-s}$ (D) None

Q.4 If $L\{f(t)\}=\frac{s+2}{s^2+1}$, $L\{g(t)\}=\frac{s^2+1}{(s+3)(s+2)}$, $h(t)=\int_0^t f(T)g(t-T)dT$ then L{h(t)} is _____.

(A) $\frac{s^2+1}{s+3}$ (B) $\frac{1}{s+3}$
(C) $\frac{s^2+1}{(s+3)(s+2)}+\frac{s+2}{s^2+1}$ (D) None.

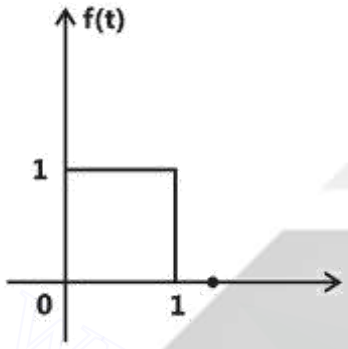
Q.5 The Laplace transform of the following function is $f(t)=\begin{cases}\sin t & \text{for } 0\le t\le\pi\\ 0 & \text{for } t>\pi\end{cases}$

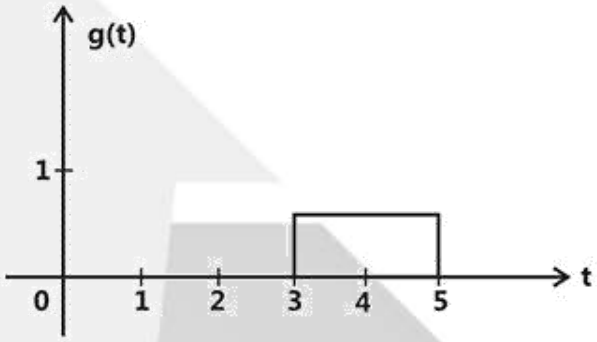
(A) $\frac{1}{(1+s^2)}$ for all $s>0$ (B) $\frac{1}{(1+s^2)}$ for all $s<\pi$
(C) $\frac{(1+e^{-\pi s})}{(1+s^2)}$ for all $s>0$ (D) $\frac{e^{-\pi s}}{(1+s^2)}$ for all $s>0$

Q.6 The Laplace transform of f(s) is $\frac{1}{s^2(s+1)}$. The function

(A) $t-1+e^{-t}$ (B) $t+1+e^{-t}$ (C) $-1+e^{-t}$ (D) $2t+e^{t}$

Q.7 Given f(t) and g(t) as shown below





g(t) can be expressed as

(A) $g(t) = f(2t-3)$

(B) $g(t) = f\left(\frac{t}{2}-3\right)$

(C) $g(t) = f\left(2t-\frac{3}{2}\right)$

(D) $g(t) = f\left(\frac{t}{2}-\frac{3}{2}\right)$

Q.8 If $x[n] = (1/3)^{|n|} - (1/2)^n u[n]$, then the region of convergence (ROC) of its Z-transform in the Z-plane will be

(A) $\frac{1}{3} < |z| < 3$

(B) $\frac{1}{3} < |z| < \frac{1}{2}$

(C) $\frac{1}{2} < |z| < 3$

(D) $\frac{1}{3} < |z|$

Q.9 The function f(t) satisfies the differential equation $\frac{d^2f}{dt^2} + f = 0$ and the auxiliary conditions, $f(0) = 0, \frac{df}{dt}(0) = 4$. The Laplace transform of f(t) is given by

(A) $\frac{2}{s+1}$

(B) $\frac{4}{s+1}$

(C) $\frac{4}{s^2+1}$

(D) $\frac{2}{s^2+1}$

Q.10 In what range should Re(s) remain so that the Laplace transform of the function $e^{(a+2)t+5}$ exist?

(A) Re (s) > a + 2

(B) Re (s) > a + 7

(C) Re (s) < 2

(D) Re (s) > a + 5

Q.11 Laplace transform of f(x) = cos h(ax) is

(A) $\frac{a}{s^2-a^2}$

(B) $\frac{s}{s^2-a^2}$

(C) $\frac{a}{s^2+a^2}$

(D) $\frac{s}{s^2+a^2}$

Q.12 If Z=x+iy where x,y are real then the value of $\left|e^{i z}\right|$

(A)1 (B) $e^{\sqrt{x^2+y^2}}$ (C) e^{y} (D) e^{-y}

Type 7: Calculus

For Concepts, please refer to Engineering Mathematics K-Notes, Calculus.

Unsolved Problems:

Q.1 If an every point of a certain curve, the slope of the tangent equal $\frac{-2x}{y}$, the curve is

(A) A straight line
(B) A parabola
(C) A circle
(D) An Ellipse

Q.2 If f(0) = 2 and f'(x) = $\frac{1}{5-x^2}$, then the lower and upper bounds of f(1) estimated by the mean value theorem are _____

(A) 1.9, 2.2
(B) 2.2, 2.25
(C) 2.25, 2.5
(D) None of the above

Q.3 Number of inflection points for the curve $y = x + 2x^4$ is _____

(A) 3 (B) 1 (C) n (D) $(n+1)^2$

Q.4 Limit of the function, $\lim_{n\to\infty} \frac{n}{\sqrt{n^2+n}}$ is _____

(A) $1/2$ (B) 0 (C) ∞ (D) 1

Q.5 Consider the following integral $\lim_{a\to\infty} \int_1^a x^{-4} dx$ _____

(A) diverges
(B) converges to 1/3
(C) converges to $-1/a^3$
(D) converges to 0

Q.6 The function $f(x) = 2x^3 - 3x^2 - 36x + 2$ has its maxima at

(A) x = – 2 only
(B) x = 0 only
(C) x = 3 only
(D) both x = –2 and x = 3

Q.7 Changing the order order of integration in the double integral $I = \int_0^8 \int_{x/4}^2 f(x,y)\ dy\ dx$ leads to $I = \int_r^8 \int_P^q f(x,y)\ dy\ dx$. What is q ?

(A) 4y (B) $16y^2$ (C) x (D)8

Q.8 By a change of variables x, (u, v) = uv, $y(u,v) = v/u$ in a double integral, the integral f(x, y) changes to $f\left(uv, u/v\right)$. Then $\phi(u,v)$ is _____.

(A) $\frac{2v}{u}$ (B) 2 uv (C) V^2 (D) 1

Q.9 Consider the function $f(x) = |x|^3$, where x is real. Then the function f(x) at x = 0 is

(A) Continuous but not differentiable

(B) Once differentiable but not twice.

(C) Twice differentiable but not thrice.

(D) thrice differentiable

Q.10 The series $\sum_{m=0}^{\infty} \frac{1}{4^m}(x-1)^{2m}$ converges for

(A) $-2 < x < 2$ (B) $-1 < x < 3$
(C) $-3 < x < 1$ (D) $x < 3$

Q.11 A political party orders an arch for the entrance to the ground in which the annual convention is being held. The profile of the arch follows the equation $y = 2x - 0.1x^2$ where y is the height of the arch in meters. The maximum possible height of the arch is

(A) 8 meters (B) 10 meters
(C) 12 meters (D) 14 meters

Q.12 Given $i = \sqrt{-1}$, wheat will be the evaluation of the definite integral $\int_0^{\frac{\pi}{2}} \frac{\cos x + i\ \sin x}{\cos x - i\ \sin x} dx$

(A) 0 (B) 2 (C) –i (D) i

Type 8: Vector Calculus

For Concepts, please refer to Engineering Mathematics K-Notes, Vector Calculus.

Unsolved Problems:

Q.1 The directional derivative of $f(x,y)=2x^2+3y^2+z^2$ at point P(2, 1, 3) in the direction of the vector $a=\vec{1}-\vec{2}k$ is

(A) $4/\sqrt{5}$ (B) $-4/\sqrt{5}$ (C) $\sqrt{5}/4$ (D) $-\sqrt{5}/4$

Q.2 For the function $\phi=ax^2y-y^3$ to represent the velocity potential of an ideal fluid, $\nabla^2\phi$ should be equal to zero. In that carve the value of 'a' has to be

(A) -1 (B) 1 (C) –3 (D) 3

Q.3 Value of the integral $\int_c xydy-y^2dx$, where c is the square cut from the first quadrant by the line x = 1 and y = 1 will be

(A) 1/2 (B) 1 (C) 3/2 (D) 5/3

Q.4 For the scalar field $u=\frac{x^2}{2}+\frac{y^2}{3}$, the magnitude of the gradient at the point (1,3) is

(A) $\sqrt{\frac{13}{9}}$ (B) $\sqrt{\frac{9}{2}}$ (C) $\sqrt{5}$ (D) $\frac{9}{2}$

Q.5 If $\bar{r}$ is the position vector of any point on a closed surface S that enclosed the volume V then $\iint_S(\bar{r}.d\bar{s})$ is equal to

(A) $\frac{1}{2}V$ (B) V (C) 2V (D) 3V

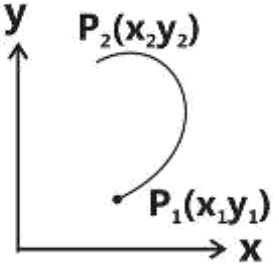
Q.6 The line integral $\int_{P_2}^{P_1}(ydx+xdy)$ from $P_1(x_1,y_1)$ to $P_2(x_2,y_2)$ along the semi-circle P_1P_2 shown in the figure is

(A) $x_2y_2-x_2y_1$

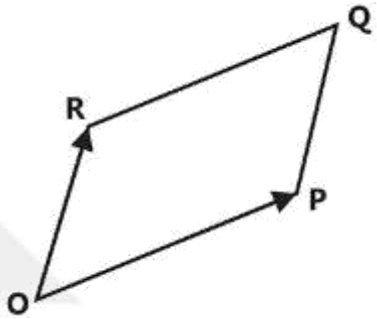
(B) $(y_2^2-y_1^2)+(x_2^2-x_1^2)$

(C) $(x_2-x_1)(y_2-y_1)$

(D) $(y_2-y_1)^2+(x_2-x_1)^2$



Q.7 For the parallelogram OPQR shown in the sketch, $\overline{OP} = a\,\hat{i} + b\,\hat{j}$ and $\overline{QR} = c\,\hat{i} + d\,\hat{j}$. The area of the parallelogram is



(A) ad – bc

(B) ac + bd

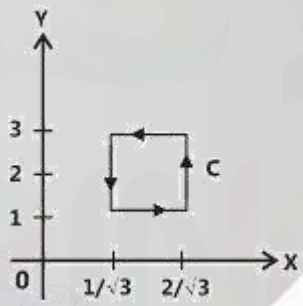
(C) ad + bc

(D) ab – cd

Q.8 $F(x,y) = (x^2 + xy)\bar{a}_x + (y^2 + xy)\bar{a}_y$. Its line integral over the straight line from $(x,y) = (0,2)$ to $(x,y) = (2,0)$ evaluates to

(A) -8 (B) 4 (C) 8 (D) 0

Q.9 $\bar{A} = xy\,\bar{a}_x + x^2\bar{a}_y$ then $\int \bar{A}.d$ lover the path shown in the figure is



(A) 0

(B) $\frac{2}{\sqrt{3}}$

(C) 1

(D) $2\sqrt{3}$

Q.10 The two vectors [1,1,1] and $\left[1, a, a^2\right]$ where $a = \frac{-1}{2} + j\frac{\sqrt{3}}{2}$ are

(A) Orthonormal
(B) Orthogonal
(C) Parallel
(D) Collinear

Q.11 Divergence of the 3 – dimensional radial vector $\bar{r}$ is

(A) 3 (B) $\frac{1}{r}$

(C) $\hat{i} + \hat{j} + \bar{k}$ (D) $3\left(\hat{i} + \hat{j} + \bar{k}\right)$

Q.12 The angle (in degrees) between two planar vectors $\bar{a} = \frac{\sqrt{3}}{2}i + \frac{1}{2}j$ and $\bar{b} = \frac{\sqrt{-3}}{2}i + \frac{1}{2}j$

(A)30 (B)60 (C)90 (D)120

Answer Key

	1	2	3	4	5	6	7	8	9	10	11	12
Type 1	A	B	B	A	C	B	B	B	D	B	D	C
Type 2	B	D	B	A	B	A	C	A	D	A	B	A
Type 3	D	D	D	A	C	A	D	C	B	B	A	D
Type 4	D	C	B	C	C	B	D	A	B	C	A	C
Type 5	A	B	A	B	A	D	C	B	A	C	D	D
Type 6	D	A	C	B	C	A	D	C	C	A	B	D
Type 7	D	B	B	D	B	A	A	A	C	B	B	D
Type 8	B	D	C	C	D	A	D	D	C	B	A	D

connect with us

facebook.com/**kreatryx**

twitter.com/**kreatryx**

plus.google.com/**kreatryx**

youtube.com/**kreatryx**

linkedin.com/**kreatryx**

info@kreatryx.com
kreatryx.thegateguru@gmail.com
+91 7406144144 +91 9819373645 0120-4326333
Address - SE 617, Shastri Nagar, Ghaziabad, U.P (201002)

www.kreatryx.com